Caltrans

CALTRANS REGIONAL OPERATIONS FORUMS

Freight and Goods Movement
Connected Vehicles

Session Overview

- What are “freight” operations?
- How can you facilitate goods movement?
- What are the emerging applications and technologies?
- How can you engage the private sector and partner agencies to collaboratively improve operations?
- What role do connected vehicles play in transportation?

What are Freight Operations?

Last Mile

Long Haul

Who makes decisions about where goods move?

Decision Maker	Type of Decision	What Governs the Decisions?
Shipper Broker Consignee	• Pick-up location • Drop-off location • Mode(s) • Gateways and transfers (ports, terminals) • routes and corridors • schedule	• Total Logistics Costs • Regulatory Compliance $ $ $
Trucker	• Some routing decisions • Where to park	• Bottom line costs • Compliance (i.e. HOS) • Information on travel and routes

Why do we care about freight?

- Freight moves the economy
- Sustains major industries in your state or region
- Sustains domestic and international trade
- Truck VMT growing faster than passenger VMT

Reliability / predictability is top operations concern of freight industry

Source:
Jeff Turner

What can agencies do to improve freight operations?

- Identify and mitigate operations issues
  - Recurring bottlenecks
  - Maintain fluidity
  - Safety hotspots
- Disseminate / integrate information
  - Road conditions
  - Truck parking
  - Truck routing
- Collaborate with the private sector

Florida DOT

What can agencies do to improve freight bottlenecks?

- Identify recurring bottlenecks
- Determine their cause(s)
- Prescribe and implement solutions

Constraint Type	Roadway Type	Freight Route
Lane-Drop	Freeway	Intercity
Interchange	Arterial	Urban
Intersection/ Signal	Local-Collector	Intermodal Connector
Roadway Geometry		Truck Access Route
Rail Grade Crossing		
Regulatory Barrier		

Truck Bottlenecks
Potential Mitigating Actions

Correct Capacity Deficiencies

- Low capacity left exits
- More through lanes

Shift or Reduce Facility Demand

- Managed lanes
- Multimodal investments

Implement Aggressive Incident Management

- Traveler information systems
- Queue warning system
- Quick clearance

Deploy Portfolio Approaches

- Multimodal strategies (combination of strategies)

Freight Fluidity

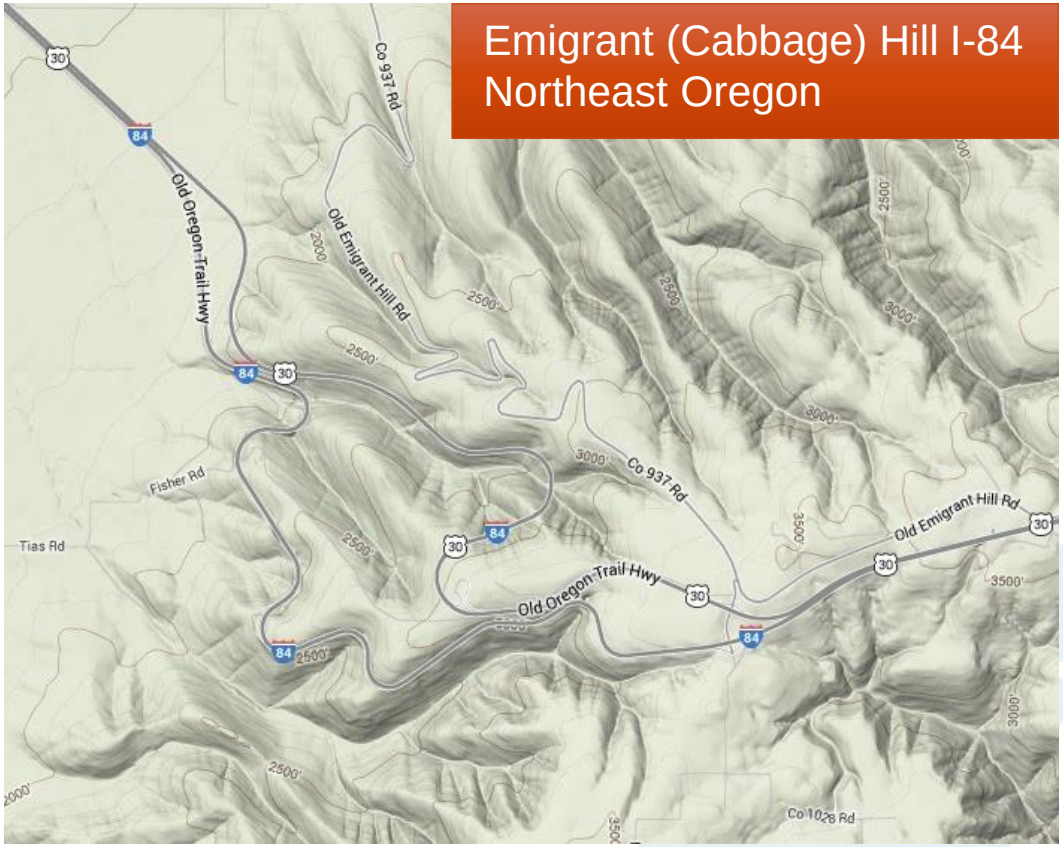
Maintaining Reliable Access

- Traffic operations works with freight planners & carriers to:
  - Identify the truck routes
  - Identify the major generators (e.g. airports, seaports, distribution centers)
  - Assess performance
- Implement measures to improve performance (e.g. signal timing, traveler information, etc.)

Florida DOT

Safety Hotspots
Oregon Downhill Speed Information System

- 6% Grade
- 2,000’ elevation change (9 miles)
- Double hairpin turn
- 51 truck accidents from 2003 to 2007 (31 truck at fault)
- 78% are out of state motor carriers



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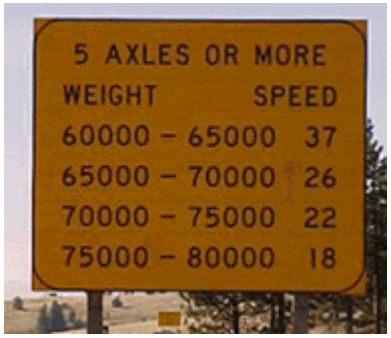
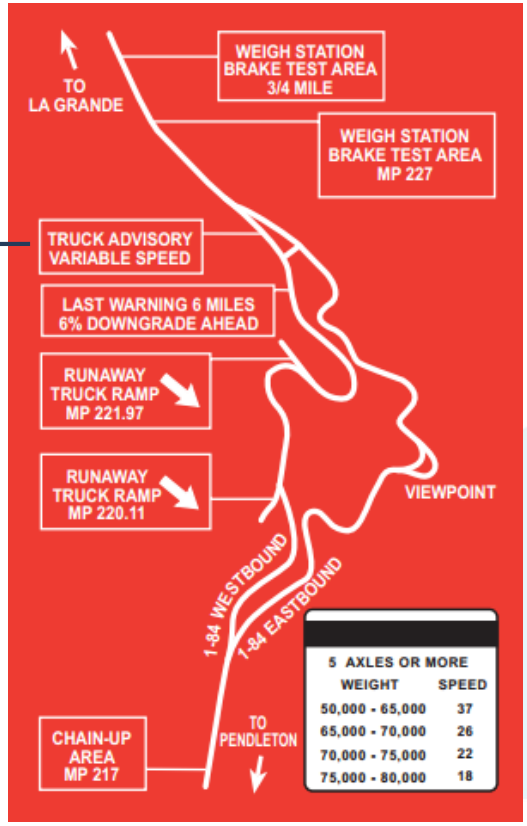
Safety Hotspots
Oregon Downhill Speed Information System

CABBAGE HILL AWARENESS PROJECT I-84





- Upstream WIM relates weight to transponder in truck to issue advisory
- Public information campaign
- 13 percent reduction in crashes

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Truck Parking
National Shortage

- Severe shortage of safe, legal parking options
  - Nearly half of trucker search an hour daily
- 2.2 million registered long-haul trucks in U.S.
- US DOT, state DOTs, and private sector working to improve information and allocation of spots

Truck Parking Reservation Systems

TSPS™
TRUCK SMART PARKING SERVICES

ABOUT | FIND PARKING | CONTACT

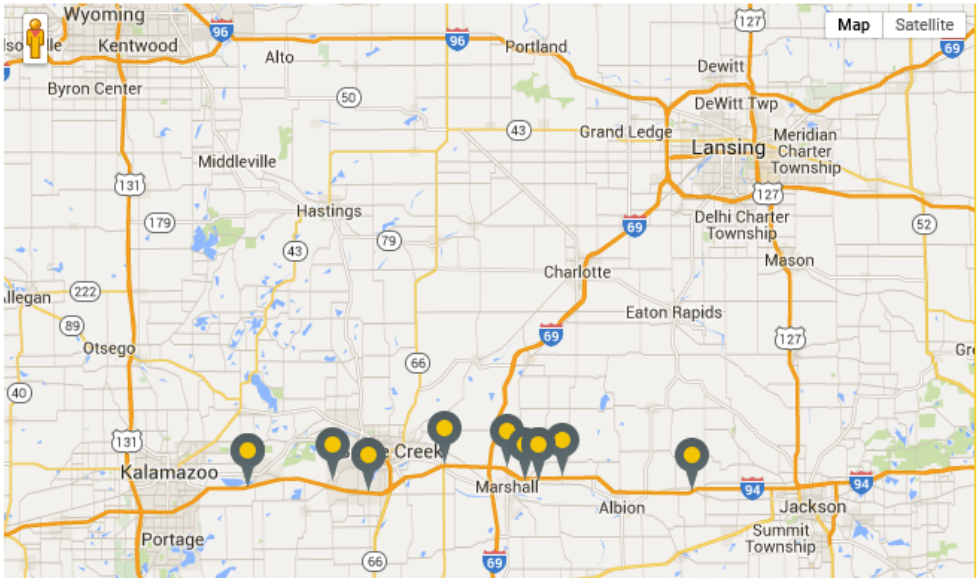
Find Parking

LOCATION

ZIP or Address

AVAILABILITY

☑ Show only lots with availability



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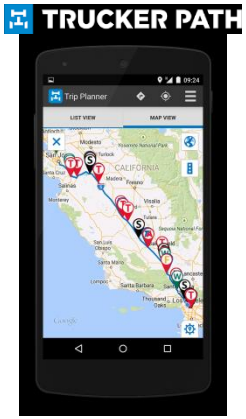
Truck Parking
Crowdsourced Information



- Trucker Path
  - Allows users to input truck parking availability at truck stops and other locations across U.S.
  - Detects when trucks are at a stop
  - 200,000 users
- Telogis Route Planning App
  - Crowd sources parking information
  - Integration of route planning / HOS
  - 140,000 users

Telogis®

Truck Parking

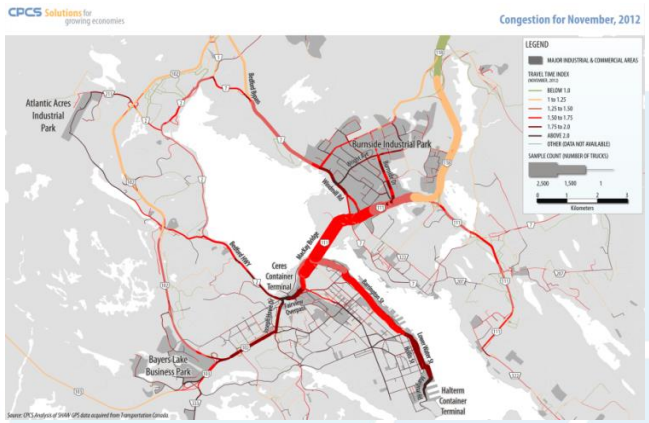
Emergency Truck Parking: Regional Cooperation

- Weather events require regional cooperation
  - Truckers need to know where to part and wait during an extreme event (e.g. highway closed in Montana).
- I-80 Winter Operations Coalition
  - California and Nevada (and the other states of the I-80 Winter Weather Corridor) coordinate closures.
  - Nevada is working with municipalities to identify truck parking when roads are closed in California (Sierra Nevada passes).

The Next Big Thing
Big Data in Freight Operations

- Private sector is just getting started
  - 8% of shippers and 5% of 3PLs surveyed have implemented “Big Data” supply chain initiatives*
- Public sector utilizing big data (truck GPS) for performance, exploring other applications (e.g. regional operations).

> “The major benefits from data come from answering unanticipated questions.”
> - Peter Kivestu, Teradata



*From Jim Taylor “Fusing Big Data and the Supply Chain: The Future is NOW.” *Inbound Logistics April 2014.)* Source: 2014 18th Annual Third-Party Logistics Study produced by Dr. C. John Langley and Capgemini Consulting.

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Stakeholder Outreach

How to integrate freight considerations into operations?

- MAP-21 Freight Advisory Groups (recommended)
  - Membership includes carriers, shippers, logistics providers
  - Involve ITS / operations staff
- Focus other efforts on matching the issue to the audience

Virginia Freight Transportation Technical Advisory Committee (VFTTC)

Stakeholder Outreach
Goods Movement Task Force

- Goods Movement Task Force meets quarterly
  - Inform members of upcoming topics and high-interest issues
  - Make it the “place to be” for networking and information
  - Formal process to shape the planning and programming process (e.g. freight projects in the regional plan)

Working Together
Multi-Agency Cooperation

- Goods move across regions
  - Corridor and multi-state groups working together on freight operations
    - I-95 Corridor Coalition
    - Northwest Passage Corridor Coalition
    - Mid-America Freight Coalition

Public Agency Role
How can you facilitate goods movement?

- Understand the role of operations in goods movement
- Work with agency staff and private sector to identify “freight” bottlenecks and develop improvement strategies
- Identify and mitigate truck crash hotspots
- Improve freight-specific communications
- Improve truck parking and information on availability
- Get to know emerging technologies and applications
- Outreach with freight stakeholders to identify operations needs and work on improvements

Public Agency Role
How can you facilitate goods movement?

- Know what truckers and shippers think about operations.
- Know the key industries of your state and corridor and their needs (and supply chains).
- Develop “Freight Operations Implementation Plans” jointly with freight planning staff

Idaho Statewide Freight Study

Recommendation / Action Steps	Considerations
Promote appropriate use of ITS technologies and applications	Weigh-in-motion technologies Automated plate recognition Transponders GPS Smart phone applications Web-based applications

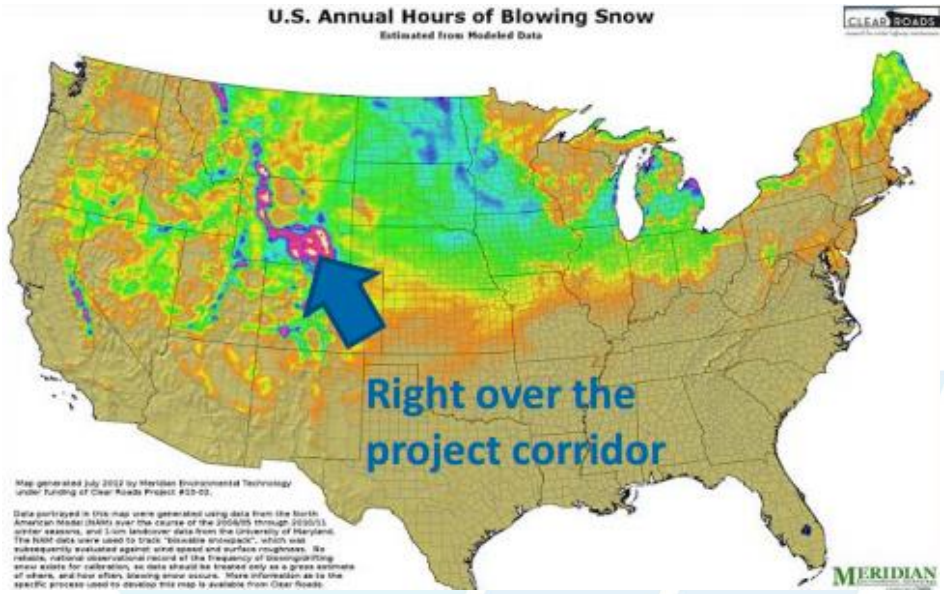
Connected Trucks

- U.S. DOT Safety Pilot Model Deployment includes trucks (Fall 2012 to Fall 2013)
- 3 trucks integrated with wireless crash warning devices
- Driver clinics with a cross section of commercial drivers. that will be part of separate truck driver clinics.
- Closed-course environment

SAFETYPILOT
CONNECTED VEHICLE TECHNOLOGY

Connected Trucks: USDOT CV Pilot Wave 1 Wyoming I-80

- Objective: Reduce the number of weather related incidents (including secondary incidents) in the corridor
- High elevation corridor
- Oct-May blowing snow and poor visibility
- 3,470 high wind crashes from 2002 to 2010



Connected Trucks: USDOT CV Pilot Wave 1 Wyoming I-80

- Vehicle to infrastructure (V2I) and vehicle to vehicle (V2V) connectivity to connect:
  - snow plows
  - trucks
  - fleet management centers
  - roadside equipment

- Provide real-time advisories both to trucks and personal vehicles en-route as well before entering the I-80 corridor.
- Applications will support roadside alerts, parking notifications, dynamic routing guidance, weather responsive variable speeds

What is a Connected Vehicle?

Connected vehicles use wireless technology to "connect" vehicles to each other and/or to infrastructure (for example, cell tower, roadside equipment, hand-held device)

- Cellular
- Dedicated short-range communication (DSRC)
- V2V, V2I, V2X

Connected Vehicle: Cell Technologies & Applications

Image courtesy of KROMKRATHOG/FreeDigitalPhotos.net

Cellular connection is established through:

- Carried-in devices like smart phones
- OEM-installed cellular equipment

Either option generates geo-located data used commercially

Connected Vehicle:
Cell Technologies & Applications

- Connected vehicles are a growing market and an important part of automotive business models.
- App developers are proliferating.
- Consumers experience transportation differently.
  - Business models are evolving and OEMs are positioning for the future.
  - Apps may be independently developed or OEM-created/approved
  - Ford and GM opened their dashboards to app developers
  - GM installing high-speed LTE on new 2015 models

Connected Vehicle: Cell
Time-line

Cell-based connected vehicles are here **now**!

Examples of connected vehicle applications in various markets

Mainly B2B

Mainly Consumer

Commercial vehicles

Transit

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How does DSRC Fit In?

Dedicated short-range communication or DSRC-equipped vehicles are a special type of connected vehicles using a mobile Wi-Fi standard particularly well suited to safety applications.

DSRC-based vehicles are moving from research into deployment.

Connected Vehicle:
DSRC Technologies & Applications

Connection through OEM-installed DSRC

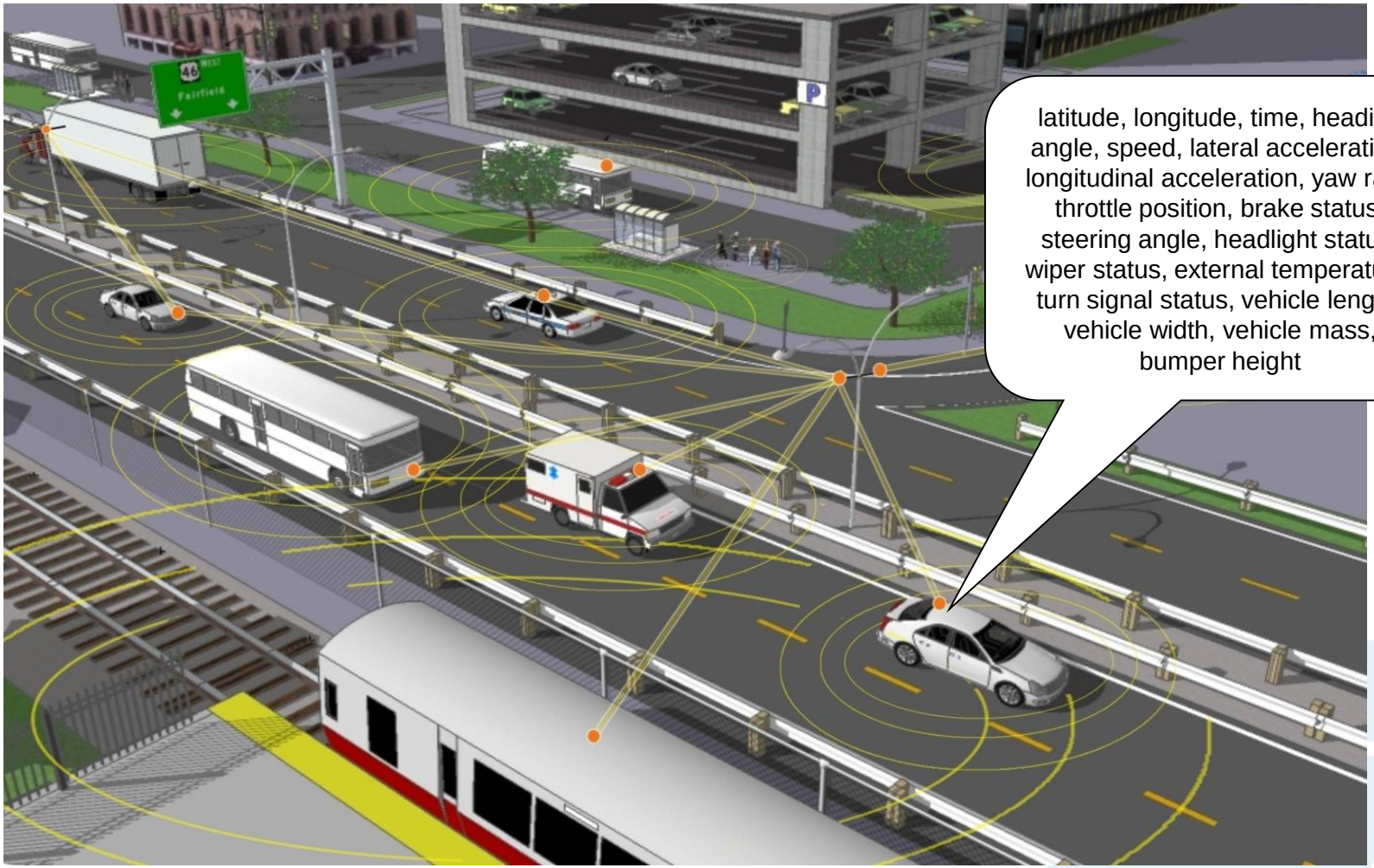
- DSRC provides high-speed (low latency), broadcast connection
  - DSRC is particularly suited for active vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) **safety applications**
  - DSRC also supports other applications
- Extensive research tested the safety benefits of DSRC-based applications
- DSRC development is moving forward

Why DSRC Matters

"V2V technology can address a large majority of crashes involving two or more motor vehicles."

Source: NHTSA

How DSRC-Equipped Vehicles Work



How DSRC-Equipped Vehicles Work

- DSRC functions at 5.9 gHz via spectrum allocated by the FCC for this purpose
  - Spectrum allocation is currently the subject of debate.
- Data from the vehicle (basic safety message) is broadcast 10x/second
- Both vehicles must be equipped with a DSRC transmitter and receiver
- V2V applications do NOT require infrastructure (except for the security network)

Connected Vehicle:
DSRC Technologies & Applications

- Six V2V safety applications were tested in Ann Arbor, MI

  - Forward Collision Warning (FCW)
  - Emergency Electronic Brake Light (EEBL)
  - Blind Spot/Lane Change Warning (BSW/LCW)
  - Do Not Pass Warning (DNPW)
  - Intersection Movement Assist (IMA)
  - Left Turn Assist (LTA)

- V2V and V2I require a security network

Policy Issues

Privacy

- Commercial & consumer apps via cellular connections are "opt-in"
- DSRC safety applications are designed to minimize collection of personal information

Data Ownership – Under study

U.S. DOT Authority

- **NHTSA** – Authority to regulate safety equipment in vehicles
- **FHWA –** Authority to provide guidance on roadside equipment

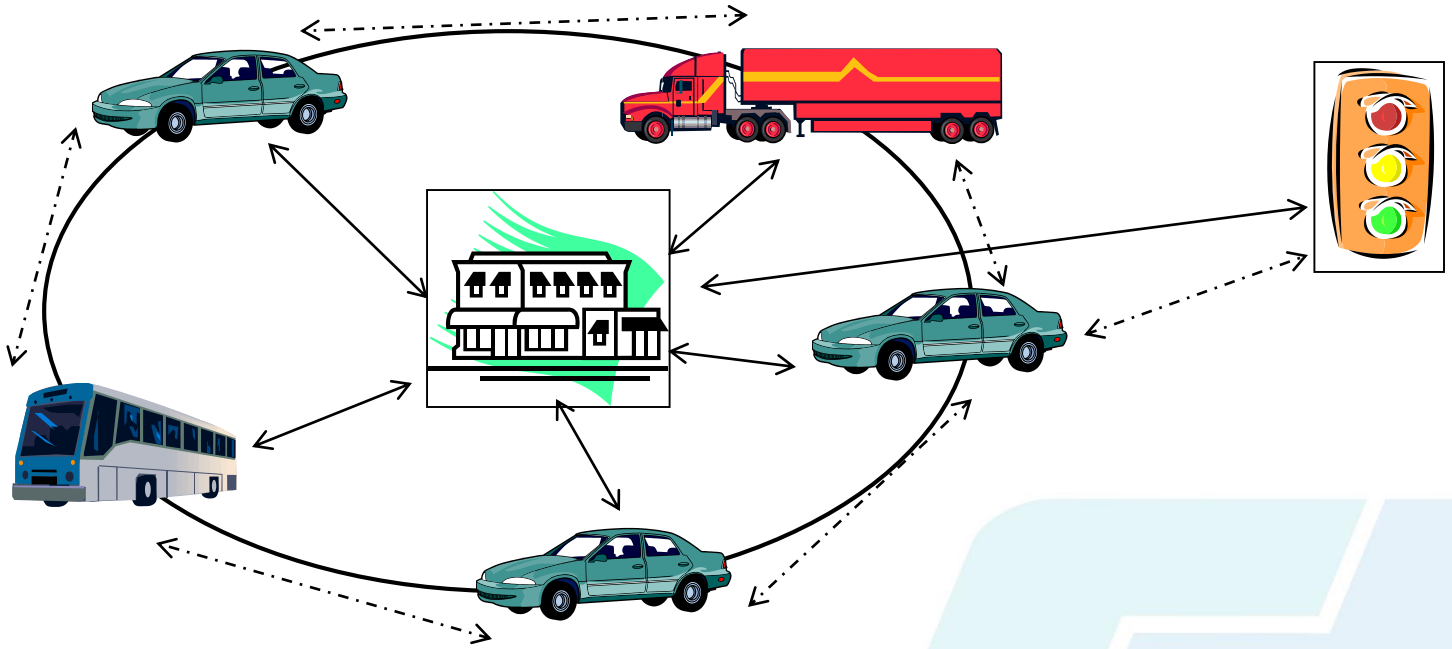
Driver Distraction – NHTSA distraction guidelines

Spectrum – DSRC relies on dedicated spectrum that is the subject of testing to evaluate options to share

Implementation Issues
DSRC-Based Vehicles

- A **security credential management system (SCMS)** is necessary and must be established in order to support DSRC in new vehicles
- USDOT is assessing the governance roles for the security network
- NHTSA released a RFI in October 2014 seeking input on establishing and operating the security system.
- Public agencies with V2I applications will have to conform to the security network
- Cost and performance requirements are not currently known

Security System & Applications Infrastructure



V2V communication via DSRC

Definition Underway

Applications infrastructure for safety (via DSRC):

- Must be part of the “trusted” network
- Adhere to possible certification requirements
- Adhere to system governance

Public Agency Preparation

Connected vehicles (either cell or DSRC-based) are a powerful tool:

- Generate **data**
- Enable information **flow**
- Provide new **capabilities** for safety, mobility, environment and more

Public Agency Preparation

How do public agencies **prepare for** and **leverage** connected vehicles <u>today</u> for the **public good**?

- Capture data
- Procure data
- Be a participant
- Provide traveler information

Connected & Automated Vehicle
Today's Status

	Cell	DSRC	Automated
Capture Data	Now	Testing	NA
Procure Data	Now	NA	NA
Participate	Emerging	Planning	Research/Test
Apps	Now (soft safety, mobility, environment	2022-2038 V2V hard safety	2018-2028 Level 3-4

Public Agency Preparation Today

Assess data/information:

- What data do you have
  - Signal data, freeway, incident, work zone, weather, other
- Is it easy to access - centralized
- What information do you need

Capture data:

- Traditional methods
- Bluetooth (V2I)

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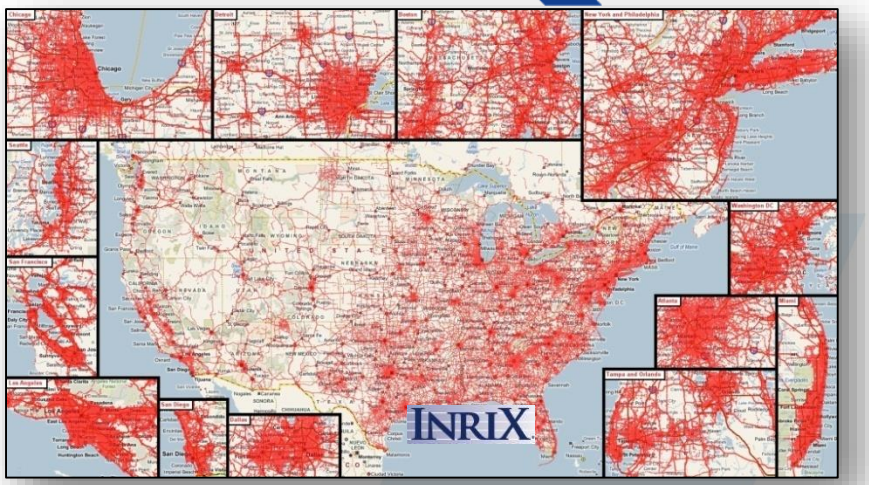
Public Agency Preparation Today

Procure data: Purchased data from third party companies may be appropriate

- Use FHWA NPMRDS data set
- What data is available from connected vehicles
- What data/information needs does it meet



Considerations:

- Assess data needs
- Purchase cost vs. installation, maintenance and operation cost

Public Agency Preparation Today

Be a Participant:

- Provide open data to enable app developers
  - Transit data
  - Some cities release signal, phase & timing (SPaT) data
  - Other data

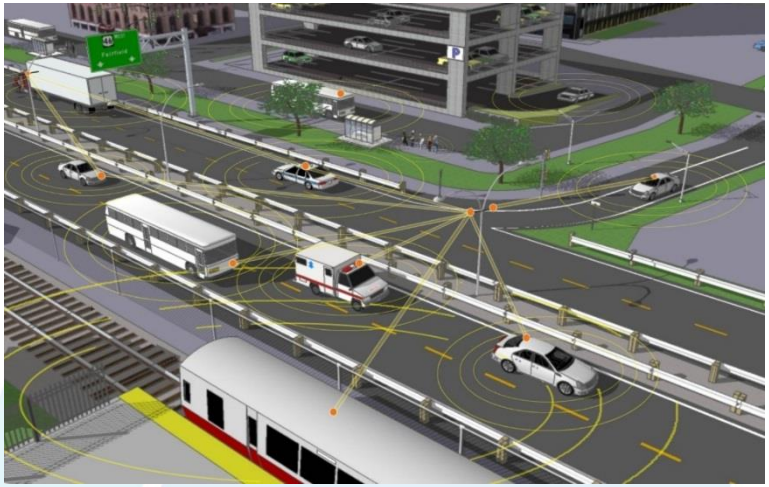
Considerations:

- Does it further your public agency goals
- Data standards

Public Agency Preparation Today

Plan or Lead the Way:

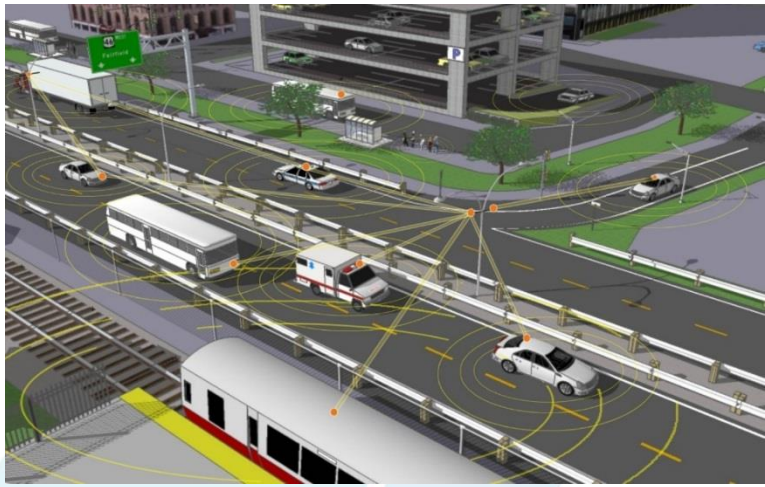
- DSRC planning
  - High-crash intersections
  - Planned signal system upgrades
  - Corridors with intense data needs
  - Locations where DSRC fills a unique data need
  - AASHTO Infrastructure Footprint Analysis
  - FHWA's "Vehicle to Infrastructure Deployment Guidance and Products"



Public Agency Preparation Today

Plan or Lead the Way:

- DSRC Leader:
  - DSRC affiliated test bed
  - Connected vehicle architecture
  - Connected vehicle deployment coalition
  - Connected Vehicle Pilot Deployment Program
    - Wave 1 announced: Wyoming, NYC, Tampa
    - Wave 2 solicitation expected in early 2017



Public Agency Preparation Today

Provide Traveler Information:

- States collect, manage and distribute traveler information
  - 511 via phone, web
  - Social media

Questions and Discussion